

The opinion in support of the decision being entered today was ***not*** written for publication and is ***not*** binding precedent of the Board.

Paper No. 43

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FRANK R. BRYANT

Appeal No. 2003-2130
Application 08/159,461

ON BRIEF

Before HAIRSTON, MCQUADE and WARREN, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal and Opinion

We have carefully considered the record in this appeal under 35 U.S.C. § 134, including the opposing views of the examiner, in the answer, and appellant, in the brief and reply brief, and based on our review, find that we cannot sustain the grounds of rejection advanced on appeal: appealed claims 1, 7 through 9, 34, 40 through 45, 56 and 58 through 65 under 35 U.S.C. § 112, first paragraph, written description (answer, pages 4 and 6-8); and appealed claims 66 through 69 under 35 U.S.C. § 103(a) as being unpatentable over Geipel, Jr. et al. (Geipel) in view of Haddad et al. (Haddad) (answer, pages 4-5 and 8).¹

¹ In addition to the appealed claims, claims 70 through 73 are also of record and have been withdrawn from consideration by the examiner under 37 CFR § 1.142(b) in the Office action mailed November 30, 2001 (Paper No. 33).

It is well settled that the examiner has the burden of making out a *prima facie* case that the appealed claims do not comply with § 112, first paragraph, written description requirement, by setting forth evidence or reasons why, as a matter of fact, the written description in appellant's disclosure would not reasonably convey to persons skilled in this art that appellant was in possession of the invention defined by the claims, including all of the limitations thereof, at the time the application was filed. *See generally, In re Alton*, 76 F.3d 1168, 1172, 1175-76, 37 USPQ2d 1578, 1581, 1583-84 (Fed. Cir. 1996), citing *In re Wertheim*, 541 F.2d 257, 262-64, 191 USPQ 90, 96-97 (CCPA 1976). It is further well settled that while the written description does not have to describe the invention later claimed *in haec verba*, such written description "must . . . convey with reasonable clarity to those skilled in the art that . . . [appellant] was in possession of the invention . . . now claimed." *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991); *see also Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323, 56 USPQ2d 1481, 1483 (Fed. Cir. 2000); *Wertheim*, 541 F.2d at 262-65, 191 USPQ at 96-98. Thus, where "the specification contains a description of the claimed invention, albeit not *in ipsius verbis* (in the identical words), then the examiner or the Board, in order to meet the burden of proof, must provide reasons why one of ordinary skill in the art would not consider the description sufficient." *Alton* 76 F.3d at 1175-76, 37 USPQ2d at 1583. A negative limitation which does not appear in the written description of the specification as filed would cause the claim to violate the written description requirement of § 112, first paragraph, if it introduces new concepts. *See Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983), *aff'd mem.*, 738 F.2d 453 (Fed. Cir 1984), citing *In re Anderson*, 471 F.2d 1237, 176 USPQ 331 (CCPA 1973).

The issue raised by the examiner involves the following italicized clause in the context of illustrative claim 1 which is drawn to "[a] method for fabricating a portion of a semiconductor device comprising" at least the steps wherein

the gate structure [is] formed by:

depositing the insulating oxide layer on the substrate;

depositing the polysilicon layer on the oxide layer;

implanting nitrogen ions only into the polysilicon layer; and

annealing the layers to form a nitride layer only between the oxide layer and the polysilicon layer

The examiner does not set forth the factual foundation for a *prima facie* case under this section of the statute in the statement of the rejection (answer, page 4). However, it seems that the examiner's position is that the italicized phrase limiting the implanted nitrogen ions *only* to the polysilicon layer constitutes a "negative limitation or exclusionary proviso" which is not supported by a showing of fact in the specification and figures thereof in the same manner as the specification and **FIG. 2d** of Haddad which "shows nearly the identical structure" to that in present specification **FIG. 10**, that is, each of the figures depict implantation of nitrogen ions into a structure wherein a polysilicon layer is on top of a silicon oxide layer (answer, pages 6-7).

Upon comparison of the respective disclosures, we find that the present specification discloses in the written description that nitrogen ions are implanted into the polysilicon layer **22**, and upon annealing, silicon nitride layer **20** is formed in the polysilicon layer **22** at the boundary or interface thereof with the silicon oxide layer **16**, as shown in specification **FIG. 4**, with *no* mention anywhere in the specification of any nitrogen implantation in silicon oxide layer **16** and/or subsequent formation of a silicon nitride layer in silicon oxide layer **16** during the annealing step (e.g., page 9, line 4, to page 10, line 3, particularly, page 9, lines 20-28). In contrast, we find that Haddad discloses that "as shown in **FIG. 2d**, a nitrogen ion implantation is performed . . . [wherein] an *implant energy* . . . [implanted] nitrogen ions into the polysilicon [layer] **14** and the [silicon] oxide [layer] **12**" (col. 4, lines 7-12; italicized emphasis supplied). Haddad further discloses in this respect that

FIG. 4 . . . [shows that] the nitrogen profile changes significantly such that there is a pile-up of nitrogen at the polysilicon/silicon dioxide interface and again at the silicon dioxide/substrate interface. In other words, within the silicon dioxide layer 12 there are formed Si_xN_y compounds at the interfaces of the silicon dioxide layer with adjacent layers (see **FIG. 4**, peak points **18** and **20**). [Col. 4, lines 32-41.]

Thus, according to the examiner, in the absence of express process conditions in the present specification which confine nitrogen ion implantation and the formation of a silicon nitride layer by subsequent annealing to the polysilicon layer boundary or interface with the silicon oxide layer and evidence that this in fact occurs in similar manner to the evidence in Haddad, there is no disclosure of such a result in the specification, and because the implantation

and annealing step can therefore result in two silicon nitride layers as disclosed in Haddad, appellant was not in possession of the method claimed using said clause in appealed claim 1 and the other claims here rejected, at the time the application was filed (answer, pages 7-8).

Appellant contends that the passage of the specification we refer to above “only describes implantation into the polysilicon layer without any teaching or suggestion of implantation [in] other layers,” and submits that “[a]bsent some evidence that nitrogen implantation into the polysilicon must inherently and necessarily result in implantation into other layers underlying the polysilicon, the claim limitation is adequately described in the specification” (brief, pages 7-9; *see also* reply brief, pages 2-5).

We agree with appellant. The limitation of the here rejected appealed claims to a method wherein nitrogen ion implantation and annealing involves *only* the polysilicon layer is subject matter specifically described in the written description of the specification and thus, simply does *not* involve a negative limitation with respect to the remainder of the method as the examiner contends. Indeed, as a matter of fact, the passage of the specification we refer to above makes clear, as appellant argues, that the concept of implantation of nitrogen ions and subsequent annealing involving only the polysilicon layer in the context of the disclosed method was within his possession at the time the application was filed, which is all that is required by § 112, first paragraph, written description requirement. To the extent that the examiner’s position can be considered as under § 112, first paragraph, enablement requirement, the examiner has not supplied the record with evidence that, *prima facie*, one of ordinary skill in this art would have been unable to practice the method as claimed based on the information supplied in the written description in the present specification.² Indeed, the passage from Haddad we refer to above

² It is well settled that under this statutory provision, the examiner has the burden of providing a reasonable explanation, supported by the record as a whole, why the assertions as to the scope of objective enablement set forth in the specification are in doubt, including reasons why the description of the invention in the specification would not have enabled one of ordinary skill in this art to practice the claimed invention without undue experimentation, in order to establish a *prima facie* case under the enablement requirement of the first paragraph of § 112. *See In re Wright*, 999 F.2d 1557, 1561, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993); *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988); *In re Strahilevitz*, 668 F.2d 1229, 1232, 212 USPQ 561, 563 (CCPA 1982); *In re Marzocchi*, 439 F.2d 220, 223-24, 169 USPQ 367, 369-70 (CCPA 1971). It is further well settled that “[a]n inventor need not . . . explain every

clearly discloses to one of ordinary skill in this art that the implantation and annealing steps as disclosed therein involved *both* the polysilicon *and* the silicon oxide layers.

Accordingly, on this record, we reverse the ground of rejection under 35 U.S.C. § 112, first paragraph.

Turning now to the ground of rejection under 35 U.S.C. § 103(a), it is further well settled that in order to establish a *prima facie* case of obviousness under § 103(a), the examiner must show that some objective teaching, suggestion or motivation in the applied prior art taken as a whole and/or knowledge generally available to one of ordinary skill in this art would have led that person to the claimed invention as a whole, including each and every limitation of the claims arranged as required by the claims, without recourse to the teachings in appellant's disclosure. *See generally, In re Rouffet*, 149 F.3d 1350, 1358, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998); *Pro-Mold and Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1629-30 (Fed. Cir. 1996); *In re Fritch*, 972 F.2d 1260, 1265-66, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992); *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); *In re Laskowski*, 871 F.2d 115, 10 USPQ2d 1397 (Fed. Cir. 1989); *In re Fine*, 837 F.2d 1071, 1074-76, 5 USPQ2d 1596, 1598-1600 (Fed. Cir. 1988). In these respects, it is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, *see Fritch*, 972 F.2d at 1264-65, 23 USPQ2d at 1782-83; *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968), presuming skill on the part of this person. *In re Sovish*, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985).

The examiner relies on the combined teachings of Geipel and Haddad in rejecting appealed independent claim 66, on which the other here rejected appealed claims depend. In traverse, appellant's arguments are based on the following limitations in context in illustrative

detail [of the invention] since he is speaking to those skilled in the art. What is conventional knowledge will be read into the disclosure. Accordingly, an applicant's duty to tell all that is necessary to make or use varies greatly depending upon the art to which the invention pertains." *In re Howarth*, 654 F.2d 103, 105, 210 USPQ 689, 691 (CCPA 1981).

claim 66:³

patterning the polysilicon, nitride, and oxide layers to expose portions of the substrate: and

reoxidizing the exposed substrate and polysilicon layer, forming oxide on exposed surfaces of the patterned polysilicon layer and the exposed substrate,

wherein the oxide formed on the exposed substrate during reoxidation has a thickness greater than the patterned oxide layer and includes a portion extending under oxide formed on a peripheral surface of the patterned polysilicon layer during reoxidation.

The disclosure of Geipel pertains to these limitations, with respect to which the examiner contends that this reference shows

forming an oxide layer using thermal growth at a thickness of 150 to 800 angstroms on a semiconductor substrate for a gate electrode (see col. 4 lines 36-38); depositing phosphorous doped polysilicon on said gate insulator to a thickness of about 1000 to 5000 angstroms; patterning the oxide and the polysilicon to form a gate electrode and a gate oxide (see col. 4-lines 42-57); and reoxidizing the exposed substrate and the polysilicon layer to a thickness of 2500 angstroms, thereby forming oxide on exposed surfaces of the patterned polysilicon layer and the exposed substrate (see col. 6-lines 22-26), and furthermore note that the oxide formed during the reoxidation step is thicker than the previously patterned oxide layer, and since the structure of [Geipel] and the instant application are the same inherently a portion of the oxide formed during the reoxidation process extends under oxide formed on a peripheral surface of the patterned polysilicon layer during reoxidation. [Answer, pages 4-5.]

Appellant argues that Geipel and Haddad do not show or suggest the second limitation quoted above, and that “the reoxidation need NOT necessarily be thicker than the gate oxide” (brief, page 11). The examiner responds that “the gate electrode oxide has a thickness of from 150 to 800 angstroms and the reoxidation oxide has a thickness of 2500 angstroms, which would inherently lead to any undercut around an edge of the gate electrode (resulting from patterning) be filled by the reoxidation oxide” (answer, page 8). In reply, appellant notes col. 6, lines 25-26 of Geipel, and argues that the reference “does not expressly state or depict formation of a corresponding thickness of oxide either on the gate electrode sidewalls or over regions adjacent

³ We note here that a ground of rejection under § 103(a) based on this same combination of references was affirmed by a prior panel of this Board in a decision entered February 28, 2001, in the present application (Paper No. 27) in Appeal No. 1998-1439, which ground of rejection involved different claims than now before us in the present appeal.

the gate electrode” (reply brief, page 4).

In following the method steps disclosed in col. 4 of Geipel, we find that subsequent to the deposition of phosphorous doped polysilicon over the 150 to 800 angstroms of silicon dioxide which provides the gate insulating layer,

the last deposited layer of polysilicon is etched to form IGFET gate electrodes. Retaining or removing and regrowing the gate dielectric *over remaining portions* of the substrate to act as an ion implantation screen in the next step is optional at this point.

Source and drain regions are next formed by ion implantation/drive in process using both the polysilicon and [semi-recessed dielectric oxide] areas as a mask. [Col. 4, lines 35-60; emphasis supplied.]

In comparing the methods steps of Geipel with the limitations in claim 66 that we set forth above, it is readily apparent that it is the step of “regrowing the gate electrode over the remaining portions of the substrate” *prior* to the formation of source and drain regions in Geipel which corresponds in certain respects to the claimed “reoxidizing” step. The deficiency in this reference disclosure with respect to the claim limitations is two fold as appellant points out. First, there is no teaching to “regrow” the gate oxide over *all* of the exposed surfaces of the patterned substrate, which includes the polysilicon layer. And, second, there is no teaching of the thickness of the “regrown” gate oxide on the exposed substrate. With respect to the latter, the examiner’s inherency theory is untenable because it is based on further disclosure at col. 6, lines 22-26, which involves a step in a “preferred process related specifically to the source drain junction formation” (col. 6, lines 8-9; *see also* col. 4, line 60, to col. 5, line 1, and col. 6, lines 11-21; and the Office action of November 30, 2001, Paper No. 33, page 3, last three lines of the fourth full paragraph) and not the “regrowing” step.

Accordingly, on this record, we reverse the ground of rejection under 35 U.S.C. § 103(a). The examiner’s decision is reversed.

Reversed

KENNETH W. HAIRSTON
Administrative Patent Judge

JOHN P. MCQUADE
Administrative Patent Judge

CHARLES F. WARREN
Administrative Patent Judge

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Application 08/159,461

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